

What is claimed is:

1. A multi-air conditioner comprising:

an outdoor unit installed at an outdoor location, and having therein a compressor, a refrigerant flow control part connected to a discharge outlet of the compressor, for guiding refrigerant according to an operation condition, an outdoor heat exchanger connected with the refrigerant flow-control part, and a pipe part connecting the elements;

a plurality of indoor units installed at respective indoor rooms and provided therein with an indoor heat exchanger of which one end is connected with a distributor, and an electronic expansion valve of which one end is connected the indoor heat exchanger and the other end is connected with the distributor; and

the distributor being provided between the outdoor unit and the indoor units, for selectively guiding the refrigerant introduced from the outdoor unit to the plurality of indoor units according to the operation condition and inversely guiding the refrigerant passing through the indoor units, to the outdoor unit,

the pipe part having a first connection pipe of which one end is connected to the refrigerant flow-control part, the other end is connected to the distributor and an outdoor heat exchanger is connected between the one end and the other end, a second connection pipe of which one end is connected with the

refrigerant flow-control part, for guiding the compressed refrigerant to the distributor, and a third connection pipe connecting an suction inlet of the compressor with the distributor and having a mid portion connected to the refrigerant flow control part, for guiding a low pressure/vapor-phase refrigerant to the compressor.

2. The multi-air conditioner of claim 1, wherein the operation condition comprises:

a first mode in which all the indoor rooms are operated in a cooling mode;

a second mode in which a majority of indoor rooms are operated in the cooling mode and a minority of rooms are operated in a heating mode;

a third mode in which all the indoor rooms are operated in the heating mode; and

a fourth mode in which a majority of indoor rooms are operated in the heating mode and a minority of indoor rooms are operated in the cooling mode.

3. The multi-air conditioner of claim 2, wherein the refrigerant flow-control part comprises:

a first auxiliary connection pipe of which one end is connected with the discharge outlet of the compressor;

a passage control unit of which one end is connected to the other end of the first auxiliary connection pipe, the passage control unit changing the flow of the refrigerant introduced from the first auxiliary connection pipe according to the operation condition;

a second auxiliary connection pipe of which one end is connected with the passage control unit and the other end is connected with the first connection pipe; and

a third auxiliary connection pipe of which one end is connected with the passage control unit and the other end is connected with the mid portion of the third connection pipe.

4. The multi-air conditioner of claim 3, wherein the passage control unit is provided therein with an electronic valve for controlling the flow of the refrigerant by an electronic control method according to the operation condition.

5. The multi-air conditioner of claim 3, wherein the passage control unit guides the refrigerant with changing the position thereof according to the operation condition, and comprises an inner valve having a flow passage formed therein.

6. The multi-air conditioner of claim 5, wherein the refrigerant flow-control part further comprises a delay-

preventive unit for allowing the operation of the passage control unit to be performed without a delay.

7. The multi-air conditioner of claim 6, wherein the delay-preventive unit comprises:

a delay-preventive pipe of which one end is connected with a mid portion of the second connection pipe; and

a pressure-closing pipe of which one end is connected with the other end of the delay-preventive pipe and the other end is connected with the passage control unit, the pressure-closing pipe guiding a predetermined amount of the refrigerant to an inside of the passage control unit to fix the inner valve such that one side of the inner valve is continuously pressed during the operation of the third or fourth mode.

8. The multi-air conditioner of claim 7, wherein the second connection pipe is connected to the mid portion of the first auxiliary connection pipe of the refrigerant flow control part, and the passage control unit comprises a four-way valve.

9. The multi-air conditioner of claim 8, wherein the delay-preventive unit comprises:

a uniform pressure valve provided on the delay-preventive pipe, for cutting off a low/high pressure refrigerant flowing

through the delay-preventive pipe to maintain the pressures of the refrigerants respectively at predetermined levels, during the operation of the first or second mode; and

a pressure-lowering auxiliary refrigerant flow pipe of which one end is connected with the other end of the delay-preventive pipe and the other end is connected with the mid portion of the third connection pipe, the pressure-lowering auxiliary refrigerant flow pipe lowering the refrigerant pressure of the pressure-closing pipe such that the inner valve is rapidly moved when the operation is converted from the third or fourth mode to the first or second mode.

10. The multi-air conditioner of claim 9, wherein the delay-preventive unit comprises:

an auxiliary uniform pressure valve provided on a connection part of the auxiliary refrigerant flow pipe and the delay-preventive pipe, the auxiliary uniform pressure valve cutting off a space between the auxiliary refrigerant flow pipe and the delay-preventive pipe to maintain the pressures of the refrigerants respectively at predetermined levels, during the operation of the first or second mode; and

a rapid refrigerant flow pipe provided between the uniform pressure valve and the auxiliary uniform pressure valve, for rapidly introducing the refrigerant into the pressure closing

pipe such that the inner valve is rapidly moved when the operation is converted from the first or second mode to the third or fourth mode.

11. The multi-air conditioner of claim 2, wherein the pipe part comprises:

a check valve installed on the first connection pipe adjacent to the distributor, for passing the refrigerant toward the distributor only during the first or second mode operation; and

a parallel expansion valve installed in parallel with the check valve, for guiding the refrigerant introduced from the distributor to the outdoor heat exchanger only during the third or fourth mode operation, and including an element for expanding the refrigerant.

12. The multi-air conditioner of claim 10, wherein the expansion element on the parallel expansion pipe comprises a heating electronic expansion valve, for expanding the refrigerant introduced into the outdoor heat exchanger during the third or fourth mode operation.

13. The multi-air conditioner of claim 10, wherein the pipe part comprises:

a check valve installed on the first connection pipe adjacent to the distributor, for passing the refrigerant only during the first or second mode operation; and

a parallel expansion valve installed in parallel with the check valve, for guiding the refrigerant introduced from the distributor to the outdoor heat exchanger only during the third or fourth mode operation, and including an element for expanding the refrigerant.

14. The multi-air conditioner of claim 13, wherein the expansion element on the parallel expansion pipe comprises a heating electronic expansion valve for expanding the refrigerant introduced into the outdoor heat exchanger during the third or fourth mode operation.

15. The multi-air conditioner of claim 2, wherein the distributor comprises:

a guide pipe part for guiding the refrigerant introduced through the first or second connection pipe of the outdoor unit to the indoor units according to the operation mode and guiding the refrigerant introduced from the indoor units to the outdoor unit through the first or third connection pipe; and

a valve part installed on the guide pipe part, for controlling a flow of the refrigerant such that the refrigerant

is selectively introduced into the respective indoor units according to the operation condition.

16. The multi-air conditioner of claim 15, wherein the guide pipe part comprises:

a high pressure/liquid-phase passage connected with the first connection pipe, for guiding a high pressure/liquid-phase refrigerant between the indoor units and the outdoor unit;

a high pressure/vapor-phase passage connected with the second connection pipe, for guiding a high pressure/vapor-phase refrigerant between the indoor units and the outdoor unit; and

a low pressure/vapor-phase passage connected with the third connection pipe, for guiding a low pressure/vapor-phase refrigerant between the indoor units and the outdoor unit.

17. The multi-air conditioner of claim 16, wherein the guide pipe part comprises:

a high pressure/liquid-phase refrigerant connection pipe of which one end is directly connected with the first connection pipe of the outdoor unit;

high pressure/liquid-phase refrigerant branch pipes having one end which is branched from the high pressure/liquid-phase refrigerant connection pipe according to the number of the indoor



units, and the other end connected with the electronic expansion valve of each of the indoor units;

a high pressure/vapor-phase refrigerant connection pipe of which one end is directly connected with the second connection pipe of the outdoor unit;

high pressure/vapor-phase refrigerant branch pipes having one end which is branched from the high pressure/vapor-phase refrigerant connection pipe according to the number of the indoor units, and the other end connected with the heat exchanger of each of the indoor units;

a low pressure/vapor-phase refrigerant connection pipe of which one end is directly connected with the third connection pipe of the outdoor unit; and

low pressure/vapor-phase refrigerant branch pipes having one end which is branched from the low pressure/vapor-phase refrigerant connection pipe according to the number of the indoor units, and the other end connected with the heat exchanger of each of the indoor units.

18. The multi-air conditioner of claim 17, wherein the distributor further comprises a liquefaction stop unit installed between the second connection pipe and the low pressure/vapor-phase refrigerant connection pipe, for preventing the high

pressure/vapor-phase refrigerant from being liquefied due to a stagnation during the first mode operation.

19. The multi-air conditioner of claim 18, wherein the liquefaction stop unit comprises:

a bypass pipe connecting the second connection pipe with the low pressure/vapor-phase refrigerant connection pipe, for bypassing the stagnated high pressure/vapor-phase refrigerant during the first mode operation; and

an electronic conversion valve installed on the bypass pipe, for converting the high pressure/vapor-phase refrigerant stagnated in the second connection pipe into the low pressure/vapor-phase refrigerant.

20. The multi-air conditioner of claim 18, wherein the valve part comprises selection valves respectively installed on the high pressure/vapor-phase refrigerant branch pipe and the low pressure/vapor-phase refrigerant branch pipe, for controlling the flow of the refrigerant such that when the indoor room operates in the cooling mode, a valve on the high pressure/vapor-phase refrigerant branch pipe is closed and a valve on the low pressure/vapor-phase refrigerant branch pipe is open, and when the indoor room operates in the heating mode, each of the valves is open and closed to the contrary.

21. The multi-air conditioner of claim 20, wherein the electronic expansion valve of the indoor unit guides, in the heating operation, the refrigerant from the indoor heat exchanger to the high pressure/liquid-phase refrigerant branch pipe without an expansion by full-opening an opening thereof, and guides, in the cooling operation, the refrigerant from the high pressure/liquid-phase refrigerant branch pipe to the indoor heat exchanger by adjusting the opening thereof to expand the refrigerant.

22. The multi-air conditioner of claim 14, wherein the distributor comprises:

a high pressure/liquid-phase refrigerant connection pipe of which one end is directly connected with the first connection pipe of the outdoor unit;

high pressure/liquid-phase refrigerant branch pipes having one end which is branched from the high pressure/liquid-phase refrigerant connection pipe according to the number of the indoor units, and the other end connected with the electronic expansion valve of each of the indoor units;

a high pressure/vapor-phase refrigerant connection pipe of which one end is directly connected with the second connection pipe of the outdoor unit;

high pressure/vapor-phase refrigerant branch pipes having one end which is branched from the high pressure/vapor-phase refrigerant connection pipe according to the number of the indoor units, and the other end connected with the heat exchanger of each of the indoor units;

a low pressure/vapor-phase refrigerant connection pipe of which one end is directly connected with the third connection pipe of the outdoor unit;

low pressure/vapor-phase refrigerant branch pipes having one end which is branched from the low pressure/vapor-phase refrigerant connection pipe according to the number of the indoor units, and the other end connected with the heat exchanger of each of the indoor units; and

selection valves respectively installed on the high pressure/vapor-phase refrigerant branch pipe and the low pressure/vapor-phase refrigerant branch pipe, for controlling the flow of the refrigerant such that when the indoor room operates in the cooling model, a valve on the high pressure/vapor-phase refrigerant branch pipe is closed and a valve on the low pressure/vapor-phase refrigerant branch pipe is open, and when the indoor room operates in the heating mode, each of the valves is open and closed to the contrary.

23. The multi-air conditioner of claim 22, further comprising a liquefaction stop unit installed between the second connection pipe and the low pressure/vapor-phase refrigerant connection pipe, for preventing the high pressure/vapor-phase refrigerant from being liquefied due to stagnation during the first mode operation.

24. The multi-air conditioner of claim 23, wherein the liquefaction stop unit comprises:

a bypass pipe connecting the second connection pipe with the low pressure/vapor-phase refrigerant connection pipe, for bypassing the stagnated high pressure/vapor-phase refrigerant during the first mode operation; and

an electronic conversion valve installed on the bypass pipe, for converting the high pressure/vapor-phase refrigerant stagnated in the second connection pipe, into the low pressure/vapor-phase refrigerant.

25. The multi-air conditioner of claim 24, wherein the electronic expansion valve of the indoor unit guides, in the heating operation, the refrigerant from the indoor heat exchanger to the high pressure/liquid-phase refrigerant branch pipe without an expansion by full-opening an opening thereof, and guides, in the cooling operation, the refrigerant from the high

pressure/liquid-phase refrigerant branch pipe to the indoor heat exchanger by adjusting the opening thereof to expand the refrigerant.

26. The multi-air conditioner of claim 20, wherein the distributor is installed one or more according to an installation condition of each of the indoor units.

27. The multi-air conditioner of claim 22, wherein the distributor is installed one or more according to an installation condition of each of the indoor units.

28. The multi-air conditioner of claim 25, wherein the distributor is installed one or more according to an installation condition of each of the indoor units.

29. The multi-air conditioner of claim 15, wherein the refrigerant flows through rear part of the first connection pipe, the second connection pipe, the third connection pipe and each of the guide pipe part of the distributor at equal state and pressure regardless of the operation condition.

30. The multi-air conditioner of claim 25, wherein the refrigerant flows through rear part of the first connection pipe,

the second connection pipe, the third connection pipe and each of the guide pipe part of the distributor at equal state and pressure regardless of the operation condition.